

REMARKS

A. Introduction -

In the Office action mailed June 18, 2004, claims 1-14 were rejected based upon prior art.

In response, claims 1, 3, and 12 are amended, claims 2 and 4 are cancelled, and remarks are provided.

B. Rejection of Claims 1-3, 6-8, 10-12 and 14 under 35 U.S.C. §102(b) -

These claims are rejected as being anticipated by Furuta et al. (U.S. Patent Number 6,124,023).

In this response, claim 1 is amended to generally incorporate the subject matter of cancelled claim 4. Claims 3 and 12 are amended for clarity and consistency.

More particularly, cancelled claim 4 recited a film for insulating the conductor or through-hole via from the core layer. See e.g. page 7, lines 5-8 and page 11, lines 21-25. Since claim 4 was not rejected as being anticipated by this reference, and since this subject matter of claim 4 has been added to claim 1, claim 1, as amended, is not anticipated by the reference. As rejected dependent claims 3, 6-8, 10-12, and 14 depend on currently amended independent claim 1, these dependent claims also are not anticipated.

C. Rejection of Claims 1-3, 5-8, 10-12 and 14 under 35 U.S.C. §102(b) -

These claims are rejected as being anticipated by Nagase et al. (U.S. Patent Number 5,945,222).

Again, since claim 4 was not rejected as being anticipated by Nagase et al., and since the subject matter thereof has been added to claim 1, claim 1, as amended, is not anticipated by this reference. As rejected dependent claims 3, 5-8, 10-12, and 14 depend on amended independent claim 1, these dependent claims also are not anticipated.

D. Rejection of Claims 1-14 under 35 U.S.C. §103(a)

All pending claims were rejected as being unpatentable over Furuta et al. or Nagase et al., cited above, in view of Haas et al. (U.S. Patent Number 6,224,965) or Jiang et al. (U.S. Patent Number 6,428,942).

Each of Furuta et al. and Nagase et al. is cited for teaching a board made up of prepreg(s), i.e., of resin, filler, and carbon fiber, and conductive layers. However, the Office action acknowledges on page 4 that these references fail to teach at least an insulating film enclosing the conductor on the core layer (claim 4), the amount of carbon fiber used (claim 9), or the size of the inorganic fillers used (claim 13). Nevertheless, in regard to the film, Haas et al. is cited for teaching a core layer 10 over which conductive patterns 12, 14 are formed. Further, it is indicated in the Action that insulating layers 16, 18 are over the core layer and encapsulate the conductive patterns. Jiang et al. supposedly includes a similar teaching to Haas et al.

For the following reasons, it is respectfully submitted that the present invention, as recited by amended claims 1, 3, and 5-14, was not rendered obvious by the cited combination.

As shown in Figure 1 of the present application, the insulating resin portion 12 of the present invention is between the through-hole via 30 and the core layer 10, for insulating the through-hole via 30 from the carbon fiber material 11a contained in the core layer 10. This insulating resin portion 12 contains no carbon fiber material 11a. As the carbon fiber material 11a is generally electrically conductive, the insulating resin portion 12 electrically insulates the through-hole via 30 for preventing unintended electrical shorting.

Accordingly, claim 1 has been amended, as noted above, to include generally the subject matter of claim 4, and recites, among other things, a core layer made of a carbon fiber material and a resin composite containing inorganic filler, a through-hole via penetrating the core layer, and an insulating resin portion between the core layer and the via, which insulating resin portion includes resin but not carbon fiber for insulating the via from the core layer. As a result of this structure, the through-hole via has no contact with the core layer. Moreover, this insulating resin portion is free from any carbon fiber material. By this structure, the through-hole vias are protected from breakage caused by the expansion of the resin in the thickness direction. The protection of the through-hole vias in such a manner in turn reduces problems including electrical shorting.

Even assuming that either Furuta et al. or Nagase et al. teaches the features as suggested in the Action, the secondary references fail to suggest the modification thereof to arrive at the presently claimed invention. Referring to Fig. 1 of Haas et al., it discloses only an insulating resin layer (prepregs) 16, 18 formed above and below the core 10, respectively. The micro via 42 (Fig. 2) penetrating the core 10 is in contact with the reinforcing fibers of the prepregs 16, 18. There is no means or suggestion of the need for insulating the vias from the core.

Thus, Haas et al. fails to teach at least the insulating resin portion (without carbon fibers) between the core and the through-hole via.

Jiang et al. provides no additional relevant teaching beyond that of Haas et al. described above. That is, Jiang et al., like Haas et al., merely describes forming a via hole 23 through the core 22 and filling or plating same. See e.g. Col. 3, lines 46-54. Otherwise, the core 22 containing conductive layers contacts the via 23. See, e.g. Fig. 1 of Jiang et al.

For the following reasons, it is respectfully submitted that the cited combinations of art fail to teach or disclose the invention as presently recited.

CONCLUSION

Withdrawal of the foregoing rejections is respectfully requested. Further, allowance of claims 1, 3, 5-14 is respectfully requested and an early action to this effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with the filing of this Amendment, please charge same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

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